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Testimony of

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On behalf of the

American Society of Civil Engineers

Before the

Subcommittee on Water Resources and Environment

Committee on Transportation and Infrastructure

U.S. House of Representatives

October 20, 2005

PARADISE LOST

It's gotten down to life or death for my people. The Red Cross will not even open a shelter below I–10 any more, because it's not safe. You go to the west bank of the Mississippi River at the FEMA office there, and they have a computer system you can log onto. You can see a simulation of what a category four hurricane does coming up Lake Bourne, or eastern New Orleans, coming up on the west side of New Orleans. They'll tell you that New Orleans will be inundated, 27 feet of water.

I said, my God, when I saw this. Is this really going to happen?

The guy who put the program together told me, Congressman, it ain't if, it's when, if we don't do something soon. ... [W]e'll be faced one day with horrific losses. We'll be faced on day with thousands of our citizens drowned and killed, people drowned like rats in the city of New Orleans because there's nowhere to go but up and they can't all get up.

And along the coast, we'll be leaving our homelands. We'll be having to vacate, just like the Red Cross has done. We'll have to leave the lands that our ancestors have lived on since before the Louisiana Purchase, lands that we settled on because we were kicked out of Canada, remember? We were kicked out of Nova Scotia by the British, finally settled in Louisiana, which we call paradise.

And our paradise is about to be lost.

Rep. Billy Tauzin (R-Louisiana), July 15, 2004[1]

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1 *Louisiana Coastal Area—Addressing Decades of Coastal Erosion: Hearing Before the Subcomm. on Water Resources and Env't of the House Comm. on Transp. and Infrastructure,* 108th Cong. 4 (2004).

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Mr. Chairman and Members of the Subcommittee:

Good morning. My name is Robert A. Dalrymple, and I am pleased to appear on behalf of the American Society of Civil Engineers (ASCE)[2] as you examine "**Hurricane and Flood Protection and Water Resources Planning for a Rebuilt Gulf Coast**" in the wake of Hurricane Katrina.

We want to commend you for taking the time to study how to integrate hurricane, storm and flood protection, navigation, and coastal ecosystem restoration while meeting local objectives for rebuilding New Orleans and the Gulf Coast.

My career as an educator and an engineer has been dedicated to coastal engineering, a field that deals with the complexities of engineering at the coastline, where waves and storms create large forces on structures, high water levels, and coastal erosion.

The driving focus of coastal engineering research has been to develop an ability to predict the behavior of the shoreline over both short time scales, such as the duration of a major

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2 ASCE, founded in 1852, is the country's oldest national civil engineering organization. It represents more than 139,000 civil engineers in private practice, government, industry, and academia who are dedicated to the advancement of the science and profession of civil engineering. ASCE carried out Building Performance Assessments of the World Trade Center, the Pentagon and the Murrah Federal Building, and its technical assessments following earthquakes, hurricanes, and other natural disasters. The New Orleans levee technical group includes representatives appointed by the ASCE Geo-Institute and ASCE Coasts, Oceans, Ports, and Rivers Institute. ASCE is a 501(c) (3) non-profit educational and professional society.

storm, to long-term, such as the response of a shoreline over 100 years to human intervention. We have come a long way forward towards that goal, but much work remains to be done.

I. ASCE New Orleans Levee Assessment Team

ASCE's paramount concern is for the safety, health and welfare of the public. We believe there is a tremendous opportunity to learn from the tragedy of New Orleans to prevent future loss of life and property.

After the storm, the ASCE assembled several teams of experts to examine the failures of the New Orleans levee as well as to examine the shoreline damage along the Alabama and Mississippi coastline. I led a team of four coastal engineering experts, including two visitors from the Netherlands and Japan, both countries that are challenged to design against natural disasters from the sea. I was chosen because I had traveled to Thailand after the December 26, 2004, tsunami as a member of ASCE teams sent to Indian Ocean countries to determine what engineering lessons could be learned from that disaster.

Our New Orleans team of coastal engineers was joined by another ASCE team of geotechnical engineers and one from the University of California, Berkeley. Our three teams were joined there by a U.S. Army Corps of Engineers' Engineering Research and Development Center team, which provided considerable insight and logistical support.

The purpose of joint site visit was to gather information about the failure of the levees including that data that would be lost during the process of levee repair and the passage of time, such as evidence of high water lines and wave overtopping, and evidence of any foundation movement or failure.

Following a week in the field gathering data, we released a public statement on October 7, 2005, describing our initial observations concerning the performance of the levee system during and after Hurricane Katrina, which is available on the ASCE's web site.

We stated then that, while there was major overtopping of some of the levees around the city of New Orleans, such as the Industrial Canal that resulted in the flooding of the 9th Ward, “at the 17th Street canal breach, we found no evidence of overtopping. There is, however, evidence that a section of the levee embankment that supported the floodwall moved approximately 35 feet laterally. At the London Avenue Canal north breach, the evidence also indicates that storm water levels did not exceed the height of the levees. We also saw evidence of soil mass movement at that site."

In addition, we said: "The Corps of Engineers has agreed to provide additional background documentation and the results of their own ongoing field investigations. We have made recommendations to the Corps of Engineers regarding a number of additional studies and testing, and they have agreed to continue to share with us the data that results.

We expect to perform analyses and develop findings and recommendations based on the new information." Our joint team knows, in principal, how the levees in New Orleans failed, the exact details await further analyses.

II. Policy Considerations for Congress after Katrina

A. Controlling Coastal and Offshore Development

Development along the Nation's shorelines for either commercial or residential purposes should be done in a sound manner. For residences, simple measures such as elevating buildings above predicted coastal storm surges and adding hurricane clips to roofs are measures that have reduced the loss of life and property in hurricane-prone regions. Levees can provide protection from high water levels due to storm surge. Restricting development in fragile environmental areas is another important tool. These and other coastal management practices should be applied to prevent unsafe coastal construction and the loss of beaches and wetlands.

Further, we need to protect our nation's wetlands, which are disappearing at an alarming rate. These vital natural areas, important for reducing the impact of storms by providing a buffer area, are important biological assets.

The State of Louisiana is losing coastal wetlands at an alarming rate of 25 to 35 square miles per year. The current coastal wetlands provide a buffer from hurricane storm effects to approximately 2 million residents. The loss of coastal area means that this population, which includes the City of New Orleans, will experience the full force of the hurricanes, including storm surges that will top levee systems and cause severe flooding.

The levee system, constructed to contain the Mississippi River from flooding surrounding areas, while providing a vital benefit, is one of several reasons for the coastal land loss, as it stops the natural sedimentation that flooding brings. Other reasons include oil and gas activity in the coastal area, naturally occurring subsidence, and the rise in sea level.

The key to successfully restoring a sustainable ecosystem in Louisiana coastal wetlands is to manage and use the natural forces that created the coastal area. We need to create and sustain wetlands and barrier islands by accumulating sediment and organic matter.

Maintaining these essential habitat features also recreates and sustains the physical landscape that is so very critical to the nation's economy and security. The main strategies of the plan are watershed management, such as river diversions and improved drainage and watershed structural repair, such as restoration of barrier islands and protecting wetlands.

As a nation, we need to establish a new federal policy on the beneficial use of dredged material as the standard practice for federally sponsored dredging projects. We recognize of course that this would mean a virtual ban on offshore dumping of dredged material, at

least on the Gulf Coast, as well as causing a significant increase in the cost of dredging.

There can be no question that the use of suitable dredged material, no matter how seemingly expensive to place, is essential to maintaining our coasts and tidal wetlands around the nation. For Louisiana, we need to re-engineer the entire Mississippi Delta system to start capturing sediment for our wetlands and islands. Beneficial use of dredged material is the most obvious and immediate step in this re-engineering process.

Moreover, we need to establish integrated watershed planning for the lower Mississippi River and the Mississippi Delta as the basis for any flood protection or coastal restoration program. This would require the inclusion of navigation, flood protection, hurricane protection, and ecosystem restoration as integral parts of any infrastructure planning.

B. Mitigating the Impacts of Natural and Manmade Hazards

To better cope with natural disasters, we need to better understand them. Federal funding for research into hurricane waves and surges, tsunamis, coastal erosion, and other coastal natural disasters is very low as documented in a 1999 National Research Council report, *Meeting Research and Educational Needs in Coastal Engineering***.** We need to educate and train more people with the ability to design our coastal structures to resist storms and tsunamis on our developed and undeveloped shorelines.

The nation needs sustained efforts to improve the planning, design, construction, operation, and maintenance of hurricane infrastructure systems that will mitigate the effects of natural and man-made hazards. The nation's flood protection infrastructure as well as its inland waterway system is in the same precarious state as much of the other civil infrastructure. ASCE, in its *2005 Report Card for America's Infrastructure,* has graded our navigable waterways a D- this year, down from a D+ in 2001. Dams were given a D grade. We need to attend to these essential life-protecting structures.

The U.S. Army Corps of Engineers needs to continue its policy of providing hurricane protection to coastal cities. Beach nourishment projects for beaches and barrier islands provide a real buffer between the full fury of the waves and the community. Appropriately designed levees can provide vital protection of lives and property as we have learned in New Orleans.

ASCE supports state and federal regulations and legislation to protect the health and welfare of citizens from the catastrophic impact of levee failure. The federal government must accept the responsibility for the safety of all federally designed and constructed levees and federally regulated levees.

C. Creating a National Levee Inspection and Safety Program

ASCE is concerned about levee safety and security because civil engineers are the principal professionals involved in the design, construction, maintenance, and operation of levees. Civil engineers also are the lead professionals that design new dams and

repairs to dams, conduct safety evaluations and structural security improvements at the state and federal levels. ASCE supports legislation and programs to address the legal, social, and moral responsibilities to construct, operate, and maintain dams in a safe manner

ASCE supports state and federal regulations and legislation to protect the health and welfare of citizens from the catastrophic impact of levee failure. The federal government must accept the responsibility for the safety of all federally designed and constructed levees and federally regulated levees.

We believe that Congress should enact a National Levee Inspection and Safety Program that should be modeled on the successful National Dam Safety Program.[3]

D. Restoring Louisiana Coastal Wetlands and Hurricane Protections

The key to successfully restoring a sustainable ecosystem in Louisiana coastal wetlands is to manage and use the natural forces that created the coastal area. The goals of the LCA Program are to create and sustain wetlands, including marsh, coastal swamps and barrier islands by accumulating sediment and organic matter, maintain habitat diversity by varying salinities and protecting key landforms, and to maintain the exchange of energy and organisms.[4]

Maintaining these essential habitat features also recreates and sustains the physical landscape that is so very critical to the nation's economy and security. The main strategies of the plan are watershed management, such as river diversions and improved drainage and watershed structural repair, such as restoration of barrier islands.

ASCE supports the efforts to reduce coastal land loss in the Louisiana coastal area, an area that has been named America's Wetland because of its national importance. ASCE urges continued support of the existing program for Louisiana coastal wetlands, funded by the Coastal Wetlands Planning, Prevention, and Protection Act (CWPPPA). ASCE also supports the ongoing effort to implement the comprehensive Louisiana Coastal Area

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3 S. 1836, 109th Cong. tit. VIII (2005).

4 Congress has been considering two bills (S. 728 and H.R. 2864) that would authorize the U.S. Army Corps of Engineers to implement projects to slow the rate of coastal wetlands loss in Louisiana over the next decade. Both bills would authorize funding to implement a program that the Corps recommended in a November 2004 feasibility report. The Corps recommended $1.1 billion for activities to be initiated immediately, and estimated an additional cost of $900 million for future work. Of the $1.1 billion, $828 million is to complete planning and construct five projects, called "near-term features," where the planning process is well along, and construction could be completed in about a decade. The remainder would be spent on: monitoring program performance; building small demonstration projects (a maximum cost of $25 million per project); exploring options to use dredged materials to create wetlands; and continued planning of 10 additional projects that would have to be authorized at a future date.

(LCA) Program, which will further reduce land loss and provide additional preservation and restoration.

The current federal investment in preserving Louisiana coastal wetlands, through CWPPPA, is $50 million annually. The estimated cost of the comprehensive Louisiana Coastal Area Program for America's Wetland is approximately $470 million annually for 30 years, or $14 billion. The cost of inaction in America's Wetland has been estimated to be more than $100 billion in infrastructure alone over the course of those 30 years.

The value of wetland protection measures nationwide was documented in *Conserving America's Wetlands: Implementing the President's Goal*, a report to Congress published in April 2005 by the president's Council on Environmental Quality:

Wetlands reduce flooding and erosion by trapping and slowly releasing surface water, rain, snowmelt, and floodwaters. Preserving or restoring wetlands can often provide the level of flood control otherwise provided by expensive levees. Wetlands also provide protection from erosive forces. In coastal areas, tidal wetlands help buffer the land from storm surges caused by hurricanes and tropical storms.

As a general rule, most scientists say, every mile or two of marshland will reduce a storm surge by a foot. A storm surge is the wall of water that moves like an extremely high tide in front of a hurricane. Marshland, or any other kind of land, quickly reduces the strength of winds and waves because it robs hurricanes of the warm water that fuels them. When you replace water with land, you reduce wind speed, storm surge and wave height. We had lost too much of the Gulf Coast's wetland buffer long before Katrina or Rita.

Indeed, in a presentation at the National Press Club on September 9, Gerry Galloway, a member of ASCE and chairman of a federal interagency task force that evaluated flood protection after the Great Flood of 1993 on the Mississippi River, stated that the issues we face in a post-Katrina world require an integrated, all encompassing response.

Management of the floodplain—whether along the Gulf Coast, in the lowlands of Louisiana, or anywhere else in the United States—is the shared responsibility of federal, state, and local governments, business, and those who live in or work in the floodplain. Each must know its task and carry its weight.

To reduce vulnerability of those in the floodplain we need to provide a higher level of protection to those who live in existing population centers, and especially to critical infrastructure such as hospitals, water treatment facilities, and fire stations.

We must discourage new development in the floodplain unless there is a pressing need for it and adequate protection can be provided. Population centers must be given a higher level of protection than most now have.

Finally, we must use all the tools available to reduce damages. This means use of not only structural means such as levees, floodwalls, and dams, but also non-structural approaches such as floodproofing, voluntary relocation of homes and businesses, revitalization of wetlands for storage, and use of natural barriers such as the Louisiana wetlands.

With collaborative, integrated planning, the lower Mississippi River and the Louisiana coast can be managed and redeveloped for more effective hurricane protection, wetland restoration, and economic development. It is time to join together and do the right thing for Louisiana and the Gulf Coast.

We should begin a comprehensive program to restore the coast, specifically including coastal wetlands in the restoration agenda.

We must integrate this restoration effort with an effective hurricane protection system and with responsible management of coastal floodplain redevelopment. Such management must include the painful realization that some areas of the coast should not be rebuilt or inhabited again, and that navigation practice and infrastructure must be modified to accommodate wetland and hurricane protection.

III. Conclusion

No matter what other solutions we develop, there should be no illusions about the scope and size of this endeavor. Long-term, comprehensive coastal wetland protection and restoration efforts will take decades and cost tens of billions of dollars. This will be money well spent.

A restored coast with restored wetlands and intact barrier islands, all integrated with other hurricane-protection measures, will provide significant protection to New Orleans and southern Louisiana.

These efforts will not just be about preserving a people and a way of life, however. It would be far better, for a multitude of reasons, to rehabilitate and maintain the coastline and protect these and other valuable infrastructure components.

Thank you Mr. Chairman and members of the Subcommittee. That concludes my statement. I would be pleased to answer any questions you may have.

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Professor. Dalrymple is the co-author of two books with Robert G. Dean: *Water Wave Mechanics for Engineers and Scientists* and *Coastal Processes with Engineering Applications.* He has received the ASCE Moffatt-Nichol Harbor and Coastal Engineering Award and the International Coastal Engineering Award. He is currently a member of the Marine Board of the National Research Council.